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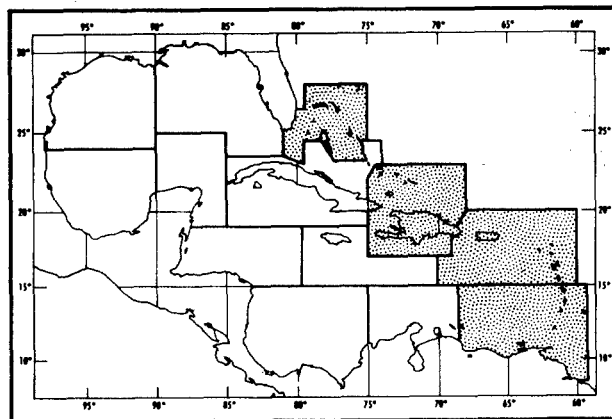
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## INFORMAL REPORT

# PROJECT FLOOD DATA REPORT CARIBBEAN SEA AUGUST 1967 TO AUGUST 1968



AUGUST 1969

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## INFORMAL REPORT

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#### ABSTRACT

Mine Divisions 41, 45, and 85 collected oceanographic data in the Caribbean Sea from August 1967 to August 1968 in support of Project FLOOD. Most of the data were collected in the vicinities of Hispaniola, Puerto Rico, and the Virgin Islands.

Acceptable data included 78 bathythermograms (BT's), 22 bottom sediment samples, and 16 water transparency (Secchi disc) and color (Forel scale) observations.

The data are a useful contribution to knowledge of the marine environment of the Caribbean Sea and will be available to agencies and institutions through the National Oceanographic Data Center.

ATWOOD S. BARWICK  
Nearshore Surveys Division  
Oceanographic Surveys Department

This report has been reviewed and is approved for release as an UNCLASSIFIED Informal Report.



L. B. BERTHOLF  
Director, Nearshore Surveys Division

## I. INTRODUCTION

### A. Purpose.

This report presents Project FLOOD oceanographic data collected in the Caribbean Sea by Mine Divisions 41, 45, and 85 from August 1967 to August 1968 (Operation Numbers 928018, 928023, and 928041). Survey operations were in the vicinities of Hispaniola, Puerto Rico, the Virgin Islands, and the British West Indies, and during ship transits between east coast United States ports, Puerto Rico, and Curacao. The following ships participated in the FLOOD operations:

<u>MINEDIV 41</u>	<u>MINEDIV 45</u>	<u>MINEDIV 85</u>
USS FRIGATE BIRD (MSC 191)	USS OBSERVER (MSO 461)	USS NOTABLE (MSO 460)
USS HUMMINGBIRD (MSC 192)	USS AFFRAY (MSO 511)	USS SALUTE (MSO 470)
USS JACANA (MSC 193)	USS ALACRITY (MSO 520)	USS ABILITY (MSO 519)
USS LIMPkin (MSC 195)		

This FLOOD report is one of a continuing series that began with IMR 0-30-63 (Underwood, 1963) which contained the oceanographic data collected by several mine divisions in the Mediterranean Sea between May 1961 and July 1962.

The FLOOD reports serve the following purposes: (1) as a vehicle for communicating FLOOD data to prospective users, (2) as an evaluation of the data and of the collecting methods, and (3) to focus the attention of future participating ships on common errors made in collecting and recording oceanographic data.

### B. Background.

Project FLOOD (Fleet Observations of Oceanographic Data) was established in 1960 as a means of developing the latent oceanographic survey potential of the U.S. Navy. To date, the Project FLOOD effort has been confined to the Mine Forces. Through the cooperation of Commander Mine Forces, U.S. Atlantic Fleet, and Commander Mine Forces, U.S. Pacific Fleet, all minesweepers deploying to foreign areas are equipped with oceanographic instruments, and the ships' crews are trained in their use. In the Mediterranean Sea, Commander, Sixth Fleet, frequently schedules operational periods for Mine Divisions to conduct FLOOD surveys. However, operational schedules to date by Mine Divisions in the Caribbean Sea have not permitted scheduled FLOOD surveys. The data in this report were collected on an opportunity basis during regular Mine Division operations.

### C. Data Acquisition Plan.

The procedures employed by Mine Divisions 41, 45, and 85 in the collection of data were set forth in "Technical Specifications and Guidelines, Project FLOOD" (NAVOCEANO, rev. 1967). In these specifications,

the Caribbean Sea-Gulf of Mexico area is divided into 13 regions as shown in Figure 1. Most of the data in this report were collected in Regions 7 and 10. The specifications include operating instructions for the use of FLOOD equipment and the locations in each region where there is a deficiency of various types of oceanographic data. The possibilities of duplicating effort or of collecting unneeded data are therefore reduced.

#### D. Operational Events.

The data collected by Mine Divisions 41, 45, and 85 included bathythermograms (BT's) (Fig. 2), bottom sediment samples (Fig. 3), and water transparency (Secchi disc) and color (Forel scale) observations (Fig. 4). The mine divisions were briefed and trained in Project FLOOD operations by a NAVOCEANO representative before departing from home port.

1. Mine Division 45. MINEDIV 45 departed Charleston, South Carolina, on 7 August 1967 for operations in the Caribbean Sea. On 9 August, OBSERVER collected one bottom sample on Navidad Bank north of Hispaniola. Two BT's also were taken in this area on 8 September. On 30 and 31 August, a second bottom sample and two BT's were taken north of Vieques Island. In addition, 11 BT's were obtained from 2 to 6 November in transit from an area southwest of Cuba to Charleston.

Between 11 and 15 October, AFFRAY obtained 9 bottom samples and 9 Secchi disc and Forel scale observations on Mouchoir and Silver Banks north of Hispaniola between Puerto Rico and the Virgin Islands.

On 8 September, ALACRITY collected two bottom samples and two BT's on Navidad Bank. MINEDIV 45 returned to Charleston on 8 November.

2. Mine Division 85. MINEDIV 85 departed Charleston on 2 January 1968 for operations in the Caribbean Sea. On 18 January, ABILITY took one BT and two bottom samples off the coast of Vieques Island. Also at this location, divers from ABILITY obtained one bottom sample and one Secchi disc and Forel scale observation. From 20 to 27 January, SALUTE collected nine BT's in transit between Puerto Rico and Curacao. An additional three BT's were obtained from 20 to 25 February in the vicinity of the Anegada Passage (east of Anegada Island and Virgin Gorda Island). On 23 February, NOTABLE collected a bottom sample off the west coast of Guadalupe Island. MINEDIV 85 returned to Charleston on 24 March.

3. Mine Division 41. MINEDIV 41 departed from Little Creek, Norfolk, Virginia, on 10 June 1968. From 11 to 16 June, JACANA collected 16 BT's while in transit from Little Creek to Puerto Rico. After departure from Puerto Rico, 20 additional BT's were taken from 2 to 27 July while circumnavigating Hispaniola and on the return to Puerto Rico.

FRIGATE BIRD and LIMPKIN collected 2 and 3 bottom samples, respectively, off the south coast of Puerto Rico from 27 to 28 June. LIMPKIN also collected three Secchi disc and Forel scale observations off the south coasts of Puerto Rico and Hispaniola.

From 5 to 23 July, HUMMINGBIRD made three Secchi disc and Forel scale observations off the west and north coasts of Hispaniola and south of Vieques Island. MINEDIV 41 returned to Little Creek on 21 August.

On an earlier deployment in August 1967, LIMPKIN participated in FLOOD operations by collecting 12 BT's north of Hispaniola and along the coast of Florida.

## II. RESULTS

### A. Data Inventory.

The oceanographic data reported by Mine Divisions 41, 45, and 85 consisted of the following:

<u>MINEDIV 41</u>	<u>Received</u>	<u>Acceptable</u>
BT's	54	48
Bottom Samples	5	5
Secchi disc/Forel scale obs.	6	6

<u>MINEDIV 45</u>		
BT's	18	17
Bottom samples	13	13
Secchi disc/Forel scale obs.	9	9

<u>MINEDIV 85</u>		
BT's	13	13
Bottom samples	4	4
Secchi disc/Forel scale obs.	1	1

BT's were collected with mechanical bathythermographs. The BT slides were processed at the National Oceanographic Data Center (NODC) and are filed under the following reference numbers:

OBSERVER	21401
ALACRITY	21698
ABILITY	22036
SALUTE	21970
JACANA	22321 (June) and 22435 (July)
LIMPKIN	21188



The BT data are not included in this report, but typical traces are presented in Figure 5.

Most of the bottom samples were obtained with Alpine Model 244 or Dietz-LaFond snapper-type grab samplers which retain about 1 pint of sediment. One sample was collected by divers. All samples were stored in plastic bags and forwarded to NAVOCEANO for sediment size and composition analyses. Computer-processed data sheets of these analyses and descriptive log sheets are presented in Appendix A.

Water transparency observations were obtained with a standard 30 cm Secchi disc with a matte white surface on one side and a matte black surface on the other. Water color observations were obtained with a Forel scale which consists of 11 vials of ammoniacal copper sulfate and neutral potassium chromate in various proportions to provide a continuous color gradation from deep blue to green. These data are presented in Appendix B.

#### B. Quality Control.

During the processing of FLOOD data, an effort is made to determine the precision of the data and to eliminate erroneous values.

1. Temperature Data. No satisfactory method has been found for validating the accuracy of the BT data in the Caribbean Sea FLOOD operations. The ships were requested to check the BT periodically by immersing it in a bucket of water with the calibrated thermometer provided with the FLOOD equipment, but no bucket calibration data were received. Comparison of the BT traces with the sea surface temperatures produced the following results:

<u>Ship</u>	<u>BT Serial No.</u>	<u>Correction Applied</u>	<u>Deviation</u>
JACANA	16197 (June)	+5.4°F	+1.5°F
LIMPKIN	528B	0	+1.0°F
OBSERVER	14682	+3.2°F	+2.0°F
SALUTE	11924	+0.9°F	+1.5°F
ABILITY	8924C	Insufficient Data	
ALACRITY	12463A	"	"

2. Bottom Grab Samples. The bottom grab samples were analyzed for sediment size and composition at NAVOCEANO in accordance with the technique given by Richards (1962).

3. Water Transparency and Color Data. No method has been devised for validating Secchi disc data.

This author has observed that Forel color identifications by different observers may differ by a scale number, and this difference appears more likely to happen at the higher scale numbers where the differences between colors become more subtle. Heavers (1967) observed

that for different surface illuminations at the same location the Forel scale value probably does not differ by more than  $\pm 1$  scale number.

4. Diver Observations. The diver estimation of the bottom composition and the results of the sample analysis suggest that either the diver is unable to make an accurate estimation or that the sample is not representative.

Comparison of the diver visibility data with the Secchi disc data collected from the surface is difficult because of the effects of the air-sea interface. Divers are instructed to use the black side of their disc as the target, but the vertical visibility recorded is in much closer agreement with the white side of the surface-observed disc.

### III. REVIEW

The results that have been obtained from the Caribbean Sea waters to date have been meager when compared with the results from other areas. The reason is due largely to numerous, unexpected operational schedule changes. However, a beginning has been made which hopefully will lead to a productive program of oceanographic observations.

The greatest problem affecting the data in this report is the lack of bathythermograph accuracy checks which severely reduces the potential accuracy of the data. Accuracies of  $\pm 0.5^{\circ}\text{F}$  should be achievable with proper calibration checks. On the positive side, the BT data received from these ships were for the most part clean and neatly annotated. Only one instance of severe hysteresis problems was indicated.

Several instances were noted where the BT was lowered below its maximum depth (especially on JACANA and SALUTE). This practice should be avoided.

### IV. SUMMARY

Mine Divisions 41, 45, and 85 have made a contribution to knowledge of the marine environment of the Caribbean Sea. Project FLOOD environmental data are used in the preparation of various data sheets, pilots, atlases, sailing directions, and other publications and instructions. The data will be available to agencies and institutions through NODC.

The data in the Appendixes were checked for errors and, where possible, an evaluation of accuracy was made.

The real and potential sources of errors in data collection are discussed in this report for the benefit of future participating ships. The principle source of error is the lack of satisfactory bathythermograph calibration checks.

## V. BIBLIOGRAPHY

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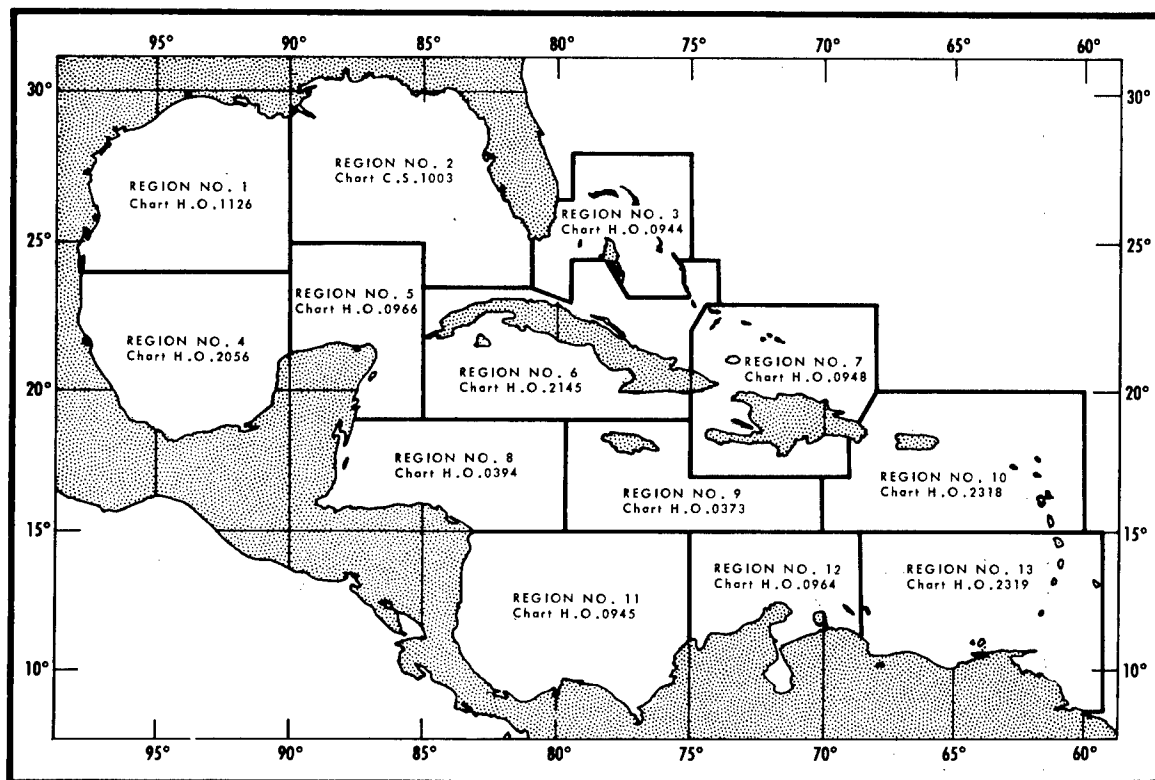


Figure 1. Project FLOOD Survey Regions, Caribbean Sea and Gulf of Mexico

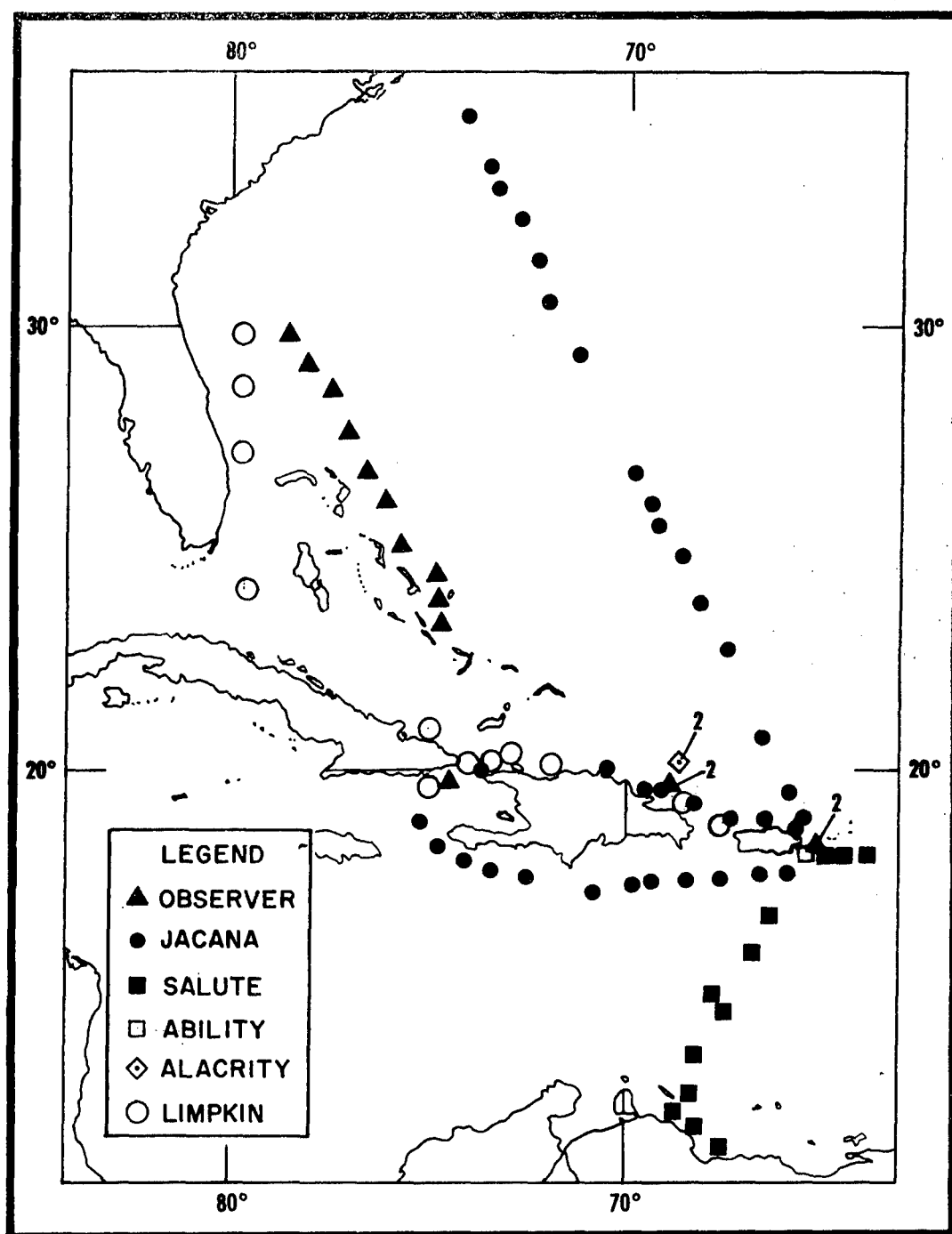


Figure 2. Bathythermograph Lowerings

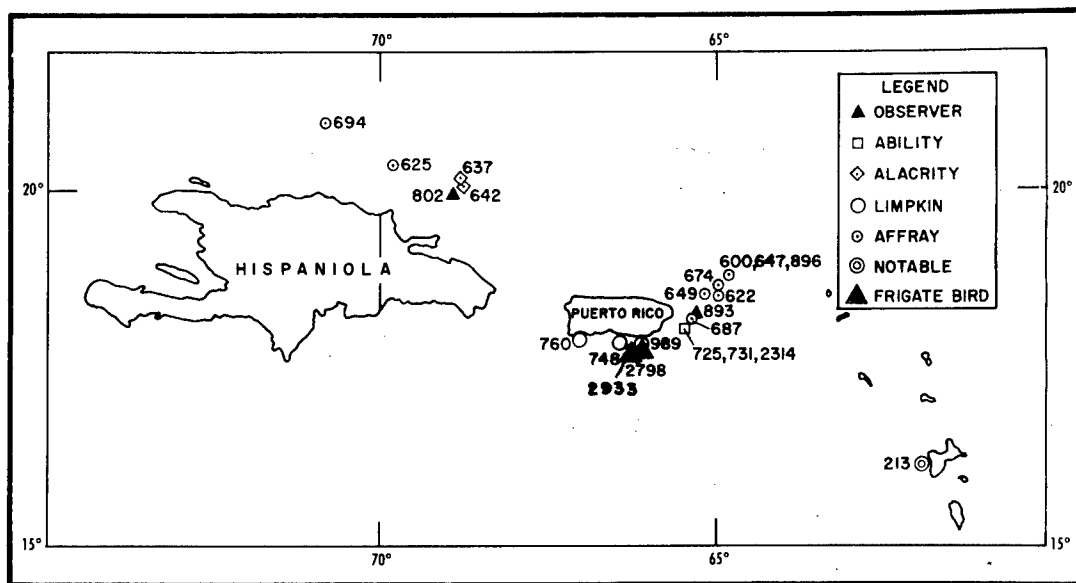


Figure 3. Bottom Sediment Samples

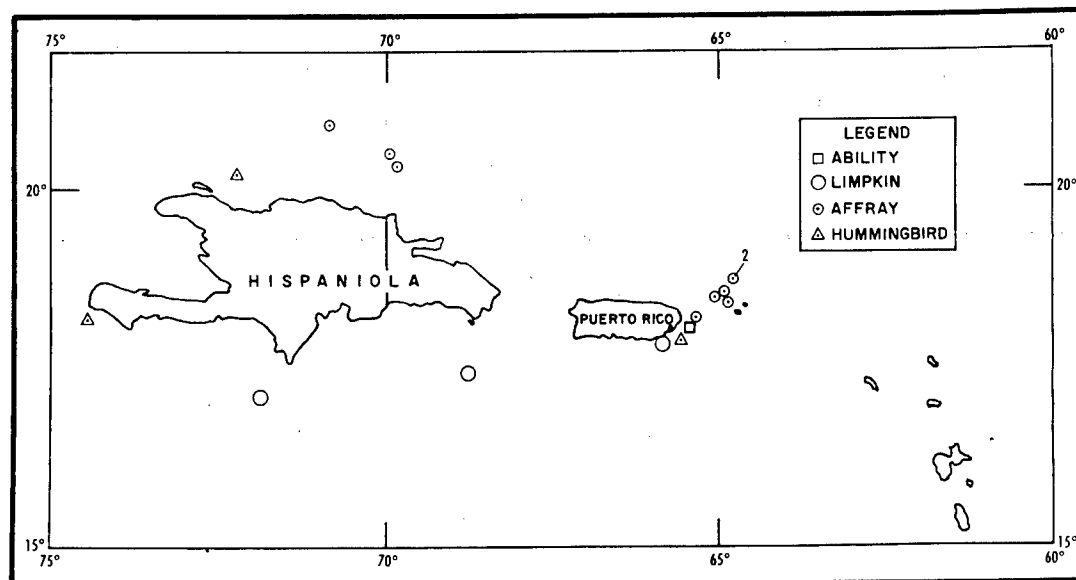


Figure 4. Water Transparency and Color Observations

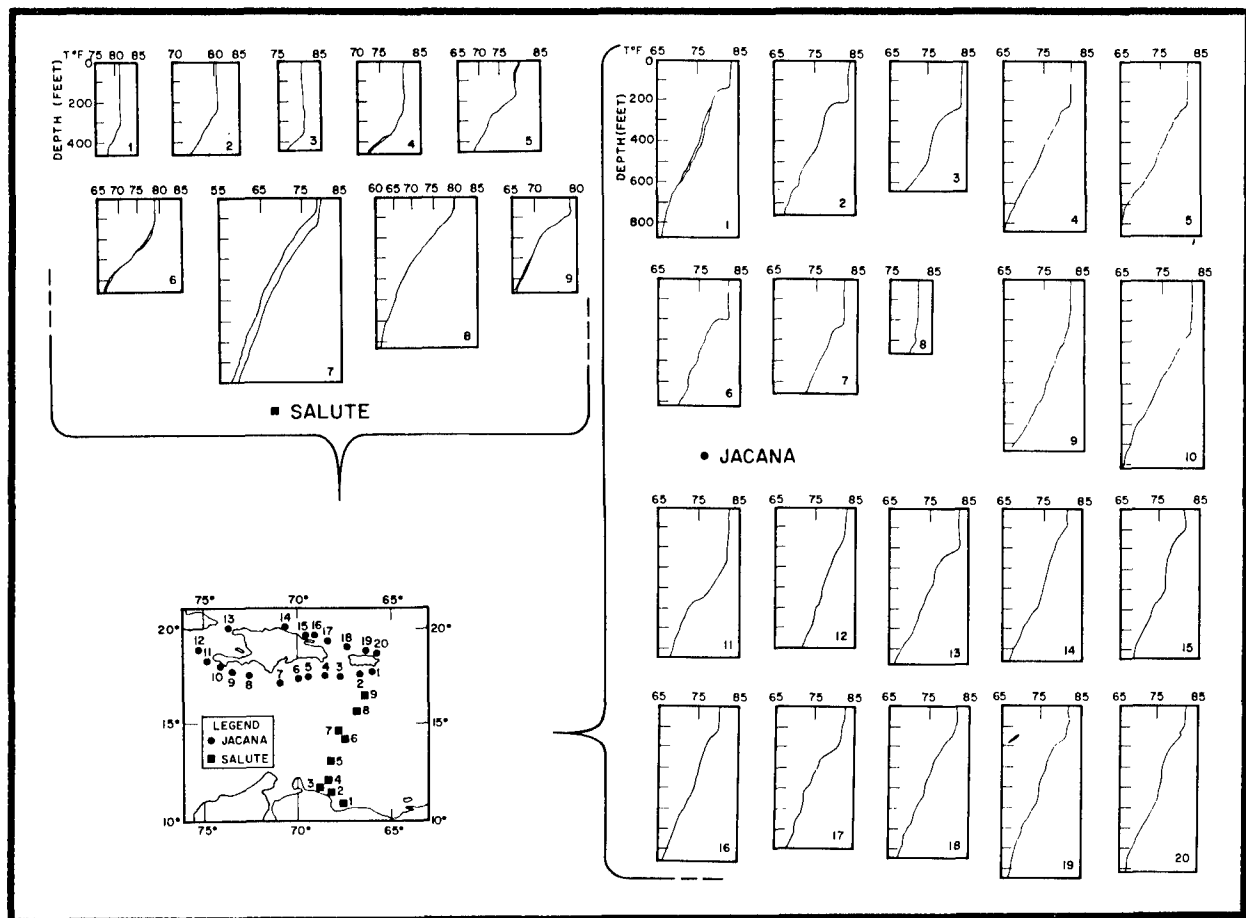


Figure 5. Typical Bathythermograms

## APPENDIX A

### Bottom Sediment Size and Composition Analyses



## EXPLANATION OF COMPUTER DATA SHEET SEDIMENT SIZE AND COMPOSITION

Results of sediment-size and -composition core analysis performed by the U. S. Naval Oceanographic Office Geological Laboratory are tabulated on Computer Data Sheet Sediment Size and Composition.

The following is an explanation of the terms employed on the Computer Data Sheet:

1. CRUISE. A number assigned to each cruise for identification purposes.
2. SAMPLE. A consecutive number applied to each core taken successively throughout the cruise.
3. LATITUDE. Expressed in degrees, minutes, and tenths of minutes.
4. LONGITUDE. Expressed in degrees, minutes, and tenths of minutes.
5. TAKEN. Date in month, day, and year that core was taken.
6. CORER TYPE. Number corresponding to sampling device code below.

1. Hydroplastic piston	6. Orange Peel
2. Hydroplastic gravity	7. Ewing
3. Kullenberg piston	8. Vibrocorer
4. Kullenberg gravity	9. Dredge
5. Phleger gravity	0. Other
7. LENGTH. Length of core recorded in centimeters as observed in the laboratory.
8. PENETRATION. Penetration of coring device recorded in centimeters as observed in the field.
9. DEPTH. The uncorrected sonic sounding recorded in meters.
10. ANALYZED. Date in month, day, and year that core was analyzed in the laboratory.
11. ID. NO. Three digit laboratory project number followed by consecutive number assigned to each subsample analyzed.
12. INTERVAL. Interval of subsample as measured in centimeters from the top of the core.

13. MM. Particle diameter size intervals based on Wentworth size grades in millimeters.

14. PER. Percent of total sample weight within the given size interval.

15. GRAVEL, SAND, SILT, CLAY. Percent of total sample weight within the four size classes.

Class ranges are: Gravel - coarser than 2 mm  
Sand - 2 to 0.0625 mm  
Silt - 0.0625 to 0.0039 mm  
Clay - finer than 0.0039 mm

16. MEAN (MM). The geometric mean of the distribution expressed in millimeters.

17. MEAN (PHI). The logarithmic mean of the distribution expressed in phi units (-log<sub>2</sub> of the diameter in millimeters).

18. STAN DEV. Standard deviation. A measure of the degree of spread or dispersion of the distribution about the mean expressed in phi units.

$$\sigma = \sqrt{\sum f (X_i - \bar{X})^2 / 100}$$

19. SKEWNESS. A measure of the asymmetry of the distribution. Positive values denote skewness of the distribution toward the fine particles, negative values denote skewness toward the coarse particles. A normal distribution has a skewness of 0.

$$\alpha_3 = \frac{1}{100} \sigma^{-3} \sum f (X_i - \bar{X})^3$$

20. KURTOSIS. A measure of the peakedness of the distribution. Positive values denote a "leptokurtic" distribution, or a distribution more "peaked" than normal. Negative values denote a "platykurtic" distribution, or a distribution more "flat" than normal. A normal curve has a kurtosis of 0.

$$\alpha_4 = \frac{1}{100} \sigma^{-4} \sum f (X_i - \bar{X})^4 - 3$$

21. CACO<sub>3</sub>. Percent calcium carbonate of the total sample weight as determined by the insoluble residue method.

22. ORG CARBON. Percent organic carbon of the total sample weight as determined by the Allison method.

23. COLOR. Wet sediment color, based on the Geological Society of America Rock-Color Chart, as determined in the laboratory.

24. DOM MINERAL. Dominant mineral (s) comprising the sample assemblage.

25. SEC MINERAL. Secondary mineral (s) comprising the sample assemblage.

## MINE DIVISION 41

LOG FOR GEAR SAMPLES

Project No: 364  
 Location: 411918

USS-FRIGATE BIRD

Logged by ACHENBACHER  
 Date Logged: 14 APR 69

	Lab No.	Color	Calc. Mat.	Sediment Type	Remarks
Sample No: 2798 Lat: 17° 51' N Long: 66° 08' W Date: 6/27/68 Water depth: 366	364 1	10YR8/2 To 10YR7/4	YES	SHELLS ENCRUSTED WITH CORALLINE ALGAE	INS. MAT. FOR SP. GR.
Sample No: 2933 Lat: 17° 51.7' N Long: 66° 18.8' W Date: 6/27/68 Water depth: 274	364 2	10YR8/2	YES	CORAL	INS. MAT. FOR SP. GR.

LOG FOR GEAR SAMPLES

Project No: 364  
 Location: 411958

USS - LIMP KIN

Logged by ACHENBACHER  
 Date Logged: 14 APR 69

	Lab No.	Color	Calc. Mat.	Sediment Type	Remarks
Sample No: 989 Lat: 17° 51.2' N Long: 66° 08.2' W Date: 6/27/68 Water depth: 366	364 3	10YR8/2 To 10YR7/4	YES	CORAL	INS. MAT. FOR SP. GR.
Sample No: 748 Lat: 17° 51.1' N Long: 66° 26.7' W Date: 6/27/68 Water depth: 366	364 4	10YR7/4	YES	CORAL	SIZE ONLY - INS. MAT FOR SP. GR. & REF.
Sample No: 760 Lat: 17° 53.9' N Long: 67° 02.7' W Date: 6/28/68 Water depth: 201	364 5	10YR7/4	YES	CORAL	2 Pieces @ 60 x 85 mm @ 90 x 120 mm NO SIZE SAMPLE SP. GR. = 2.716

# SEDIMENT SIZE AND COMPOSITION

Cruise 411918  
Sample 2798  
Latitude 17°51.0'N  
Longitude 66°08.0'W  
Corer Type DLS  
Length 0.0  
Penetration 0.0  
Depth 366  
Taken 6/27/68  
Analyzed 7/69

Cruise 411918  
Sample 2933  
Latitude 17°51.7'N  
Longitude 66°18.8'W  
Corer Type DLS  
Length 0.0  
Penetration 0.0  
Depth 274  
Taken 6/27/68  
Analyzed 7/69

10. NO. INTERVAL	364 1 0.0- 0.0
MM	PER
4.0000	58.025
2.0000	19.136
1.0000	13.117
0.5000	5.401
0.2500	1.389
0.1250	0.772
0.0625	0.617
0.0312	1.543
0.0156	0.000
0.0078	0.000
0.0039	0.000
0.0020	0.000
0.0010	0.000
0.0005	0.000
0.0005-	0.000
GRAVEL	77.160
SAND	21.296
SILT	1.543
CLAY	0.000
MEAN (MM)	3.1276
MEAN (PHI)	-1.6451
STAN DEV	1.3656
SKEWNESS	8.4502
KURTOSIS	42.9202
CAC03	0.000
ORG CARBON	0.000
COLOR	10YR82
DOM CONSTIT	SHELL
SEC CONSTIT	CORAL

10. NO. INTERVAL	364 2 0.0- 0.0
MM	PER
4.0000	74.008
2.0000	5.762
1.0000	7.682
0.5000	4.481
0.2500	3.841
0.1250	1.793
0.0625	1.024
0.0312	1.408
0.0156	0.000
0.0078	0.000
0.0039	0.000
0.0020	0.000
0.0010	0.000
0.0005	0.000
0.0005-	0.000
GRAVEL	79.770
SAND	18.822
SILT	1.408
CLAY	0.000
MEAN (MM)	3.3658
MEAN (PHI)	-1.7510
STAN DEV	1.5260
SKEWNESS	7.4538
KURTOSIS	34.9552
CAC03	0.000
ORG CARBON	0.000
COLOR	10YR82
DOM CONSTIT	CORAL
SEC CONSTIT	

# SEDIMENT SIZE AND COMPOSITION

Cruise 411958  
 Sample 989  
 Latitude 17°51.2'N  
 Longitude 66°08.2'W  
 Corer Type DLS  
 Length 0.0  
 Penetration 0.0  
 Depth 366  
 Taken 6/27/68  
 Analyzed 7/69

ID. NO.	364	3
INTERVAL	0.0-	0.0
MM	PER	
4.0000	54.423	
2.0000	23.654	
1.0000	8.654	
0.5000	5.000	
0.2500	4.038	
0.1250	1.538	
0.0625	1.154	
0.0312	1.538	
0.0156	0.000	
0.0078	0.000	
0.0039	0.000	
0.0020	0.000	
0.0010	0.000	
0.0005	0.000	
0.0005-	0.000	
GRAVEL	78.077	
SAND	20.385	
SILT	1.538	
CLAY	0.000	
MEAN (MM)	2.8779	
MEAN (PHI)	-1.5250	
STAN DEV	1.5107	
SKEWNESS	5.7675	
KURTOSIS	25.8206	
CACO3	0.000	
ORG CARBON	0.000	
COLOR	10YR82	
DOM CONSTIT	CORAL	
SEC CONSTIT		

# MINE DIVISION 45

## LOG FOR GRAB SAMPLES

Project No: 323  
Location: Caribbean Sea

USS OBSERVER

Logged By Knoop  
Date Logged 31 Jan '68

	La No.	Color	Calc. Mat.	Sediment Type	Remarks
Sample No: 802 Lat: 19° 57.1' N Long: 68° 54.0' W Date: 9 AUG '67 Water depth: 31 M	323-2	10Y 6/2	Yes	Coral Rock	Coral Rock (Pebble size) Some Organic matter  Reference Sample only
Sample No: 893 Lat: 18° 15.2' N Long: 65° 15.8' W Date: 31 AUG '67 Water depth: 22 M	323-1	5GY 8/1	Yes	Coral Rock	Coral Rock [Pebbles & cobble size] 1 small Mollusk  Reference Sample only

## LOG FOR GRAB SAMPLES

Project No: 322  
Location: OFF Puerto Rico

USS ALACRITY  
Cruise - 455207

Logged By Whitney - Knoop  
Date Logged 11 Dec 1967

	La No.	Color	Specific Gravity	Sediment Type	Remarks
Sample No: 637 Lat: 20° 09.0' N Long: 68° 49.0' W Date: 8 SEPT 1967 Water depth: 18.0 M	322-12	10YR 8/2	2.74	Sand	Calcarene Sand [bioclastics] Some Forams
Sample No: 642 Lat: 20° 08.5' N Long: 68° 48.0' W Date: 8 SEPT 1967 Water depth: 27.0 M	322-13	10YR 8/2	2.80	Sand	Same as above

## LOG FOR GRAB SAMPLES

Project No: 325  
Location: Puerto Rico

USS AFFRAY

Logged By Knoop  
Date Logged 8 Feb '68

	La No.	Color	Calc. Mat.	Sediment Type	Remarks
Sample No: 600 Lat: 18° 47.0' N Long: 64° 47.0' W Date: 14 OCT '67 Water depth: 47 M	325-3	5GY 7/2	Yes SP. Gr. = 2.73	Coral	Coral Fragments  1 Pelecypod

Sample No: 622 Lat: 18° 28.3'N Long: 64° 54.0'W Date: 14 Oct '67 Water depth: 50	325- 2	5Y 8/1	Yes SP. Gr. = 2.76	Silty- Sand	
Sample No: 625 Lat: 20° 18.0'N Long: 69° 50.0'W Date: 12 Oct '67 Water depth: 28M	325- 6	N8	Yes	Coral	large fragments of Coral  Reference Sample only
Sample No: 647 Lat: 18° 47.6'N Long: 64° 46.3'W Date: 14 Oct '67 Water depth: 47M	325- 8	N7	Yes SP. Gr. = 2.72	Sand	Coral Sand with Pebbles
Sample No: 649 Lat: 18° 32.2'N Long: 65° 06.9'W Date: 14 Oct '67 Water depth: 53.3 M	325- 5	10YR 6/2	Yes SP. Gr. = 2.72	Sand	Shell Fragments
Sample No: 674 Lat: 18° 36.8'N Long: 64° 56.0'W Date: 14 Oct '67 Water depth: 46 M	325- 9	5YR 8/1 Mixed with 5GY 7/2	Yes	Coral	Reference Sample only
Sample No: 687 Lat: 18° 14.5'N Long: 65° 20.0'W Date: 15 Oct '67 Water depth: 25.5m	325- 7	5Y 8/1	Yes	Coral	Reference Sample only
Sample No: 694 Lat: 20° 56.2'N Long: 70° 50.0'W Date: 11 Oct '67 Water depth: 37M	325- 1	N8	Yes	Coral	Coral (Pebble Size + Coral Fragments  Reference Sample only
Sample No: 896 Lat: 18° 47.5'N Long: 64° 46.5'W Date: 14 Oct '67 Water depth: 47M	325- 4	N8	Yes	Coral	Coral Sand + Pebbles Size + Reference Samples only



# SEDIMENT SIZE AND COMPOSITION

Cruise 455207  
Sample 637  
Latitude 20°9.0'N  
Longitude 68°49.0'W  
Corer Type 6  
Length 0.0  
Penetration 0.0  
Depth 18  
Taken 08/09/67  
Analyzed 11/12/67

Cruise 455207  
Sample 642  
Latitude 20°8.5'N  
Longitude 68°48.0'W  
Corer Type 6  
Length 0.0  
Penetration 0.0  
Depth 27  
Taken 08/09/67  
Analyzed 11/12/67

ID. NO.	322	12
INTERVAL	0.0-	0.0

MM	PER
4.0000	0.000
2.0000	0.202
1.0000	2.362
0.5000	42.848
0.2500	50.776
0.1250	2.362
0.0625	0.034
0.0312	0.202*
0.0156	0.202
0.0078	0.202
0.0039	0.202
0.0020	0.202
0.0010	0.202
0.0005	0.000
0.0000-	0.202
GRAVEL	0.202
SAND	98.381
SILT	0.810
CLAY	0.607

MEAN (MM)	0.4571
MEAN (PHI)	1.1296
STAN DEV	1.0169
SKEWNESS	2.4739
KURTOSIS	39.7192

CAC03	99.000
ORG CARBON	0.350
COLOR	10YR8/2
DOM MINERAL	
SEC MINERAL	

\*TRACE VALUES HAVE BEEN ESTIMATED.

ID. NO.	322	13
INTERVAL	0.0-	0.0

MM	PER
4.0000	0.000
2.0000	2.028
1.0000	17.489
0.5000	27.899
0.2500	48.603
0.1250	2.296
0.0625	0.038
0.0312	0.268*
0.0156	0.230
0.0078	0.230
0.0039	0.230
0.0020	0.230
0.0010	0.230
0.0005	0.000
0.0000-	0.230
GRAVEL	2.028
SAND	96.326
SILT	0.957
CLAY	0.689

MEAN (MM)	0.5234
MEAN (PHI)	0.9340
STAN DEV	1.2471
SKEWNESS	1.5635
KURTOSIS	20.7313

CAC03	99.000
ORG CARBON	0.340
COLOR	10YR8/2
DOM MINERAL	
SEC MINERAL	

TRACE VALUES HAVE BEEN ESTIMATED.

# SEDIMENT SIZE AND COMPOSITION

Cruise 455117  
 Sample 600  
 Latitude 18°47.0'N  
 Longitude 64°47.0'W  
 Corer Type 0  
 Length 0.0  
 Penetration 0.0  
 Depth 47  
 Taken 11/10/67  
 Analyzed 08/02/68

Cruise 455117  
 Sample 622  
 Latitude 18°28.3'N  
 Longitude 64°51.0'W  
 Corer Type 0  
 Length 0.0  
 Penetration 0.0  
 Depth 50  
 Taken 11/10/67  
 Analyzed 08/02/68

ID. NO.	325	3
INTERVAL	0.0-	0.0

MM	PER
4.0000	64.685
2.0000	14.512
1.0000	8.221
0.5000	7.487
0.2500	4.207
0.1250	0.733
0.0625	0.154
0.0312	0.000
0.0156	0.000
0.0078	0.000
0.0039	0.000
0.0020	0.000
0.0010	0.000
0.0005	0.000
0.0000-	0.000

GRAVEL	79.197
SAND	20.803
SILT	0.000
CLAY	0.000

MEAN (MM)	3.3674
MEAN (PHI)	-1.7516
STAN DEV	1.2247
SKEWNESS	12.4387
KURTOSIS	67.7951

CAC03	76.000
ORG CARBON	0.000
COLOR	5GY 7/2
DOM MINERAL	
SEC MINERAL	

ID. NO.	325	2
INTERVAL	0.0-	0.0

MM	PER
4.0000	0.000
2.0000	1.098
1.0000	1.725
0.5000	4.360
0.2500	4.109
0.1250	4.642
0.0625	7.999
0.0312	34.504
0.0156	22.585
0.0078	7.215
0.0039	2.666
0.0020	1.725
0.0010	1.882
0.0005	0.000
0.0000-	5.489

GRAVEL	1.098
SAND	22.836
SILT	66.970
CLAY	9.097

MEAN (MM)	0.0341
MEAN (PHI)	4.8748
STAN DEV	2.4920
SKEWNESS	0.2576
KURTOSIS	1.4920

CAC03	97.000
ORG CARBON	0.000
COLOR	5Y 8/1
DOM MINERAL	
SEC MINERAL	

# SEDIMENT SIZE AND COMPOSITION

Cruise 455117  
Sample 647  
Latitude 18°47.6'N  
Longitude 64°46.3'W  
Corer Type 0  
Length 0.0  
Penetration 0.0  
Depth 47  
Taken 11/10/67  
Analyzed 08/02/68

Cruise 455117  
Sample 649  
Latitude 18°32.2'N  
Longitude 65°06.9'W  
Corer Type 0  
Length 0.0  
Penetration 0.0  
Depth 53.3  
Taken 11/10/67  
Analyzed 08/02/68

ID. NO. 325 8  
INTERVAL 0.0- 0.0

MM	PER
4.0000	13.930
2.0000	11.552
1.0000	17.176
0.5000	22.688
0.2500	22.310
0.1250	9.173
0.0625	2.794
0.0312	0.378*
0.0156	0.000
0.0078	0.000
0.0039	0.000
0.0020	0.000
0.0010	0.000
0.0005	0.000
0.0000-	0.000
GRAVEL	25.481
SAND	74.141
SILT	0.378
CLAY	0.000

MEAN (MM) 0.8798  
MEAN (PHI) 0.1848  
STAN DEV 1.6401  
SKEWNESS 0.5493  
KURTOSIS -1.2906

CAC03 89.000  
ORG CARBON 0.000  
COLOR N7  
DOM MINERAL  
SEC MINERAL

\*INSUFFICIENT FOR PIPETTE ANALYSIS  
% (.378) BASED ON TOTAL % FOR  
SILT + CLAY.

ID. NO. 325 5  
INTERVAL 0.0- 0.0

MM	PER
4.0000	20.405
2.0000	28.016
1.0000	22.510
0.5000	19.636
0.2500	7.530
0.1250	1.700
0.0625	0.202
0.0312	0.000
0.0156	0.000
0.0078	0.000
0.0039	0.000
0.0020	0.000
0.0010	0.000
0.0005	0.000
0.0000-	0.000
GRAVEL	48.421
SAND	51.579
SILT	0.000
CLAY	0.000

MEAN (MM) 1.7197  
MEAN (PHI) -0.7822  
STAN DEV 1.3037  
SKEWNESS 2.5213  
KURTOSIS 8.4651

CAC03 86.000  
ORG CARBON 0.000  
COLOR 10YR6/2  
DOM MINERAL  
SEC MINERAL

# SEDIMENT SIZE AND COMPOSITION

Cruise 455117  
 Sample 896  
 Latitude 18°47.5'N  
 Longitude 64°46.5'W  
 Corer Type 0  
 Length 0.0  
 Penetration 0.0  
 Depth 47  
 Taken 11/10/67  
 Analyzed 08/02/68

ID. NO.	325	4
INTERVAL	0.0-	0.0

MM	PER
4.0000	33.437
2.0000	17.595
1.0000	13.003
0.5000	17.234
0.2500	12.590
0.1250	5.413
0.0625	0.722
0.0312	0.000
0.0156	0.000
0.0078	0.000
0.0039	0.000
0.0020	0.000
0.0010	0.000
0.0005	0.000
0.0000-	0.000

GRAVEL	51.032
SAND	48.968
SILT	0.000
CLAY	0.000

MEAN (MM)	1.6576
MEAN (PHI)	-0.7291
STAN DEV	1.6553
SKEWNESS	1.6942
KURTOSIS	3.5378

CAC03	0.000
ORG CARBON	0.000
COLOR	NB
DOM MINERAL	
SEC MINERAL	

## MINE DIVISION 85

## LOG FOR GRAB SAMPLES

Project No: 333 USS NOTABLELocation: ANTIGUA, B.W.I.Logged By RESSDate Logged 3 JULY 68

	La No.	Color	Specific Gravity	Sediment Type	Remarks
Sample No: <u>213</u> Lat: <u>16° 08.3' N</u> Long: <u>61° 53.5' W</u> Date: <u>23 Feb '68</u> Water depth: <u>914 M</u>	<u>331-</u> <u>1</u>	<u>5B 6/1</u>	<u>2.771</u>	<u>Silty</u> <u>Sand</u>	<u>Shell Fragments</u> <u>Heavy Minerals</u>

## LOG FOR GRAB SAMPLES

Project No: 331Location: CaribbeanLogged By WhitneyDate Logged April 68

	La No.	Color	Calc. Mat.	Sediment Type	Remarks
Sample No: <u>725</u> Lat: <u>18° 05.0' N</u> Long: <u>65° 26.0' W</u> Date: <u>18 Jan '68</u> Water depth: <u>21 M</u>	<u>331-</u> <u>2</u>	<u>Speckled</u> <u>Mostly</u> <u>5Y 8/1</u>	<u>Yes</u>	<u>Coarse</u> <u>Shell</u> <u>Sand</u>	<u>Calc. Sand, Pelecypods,</u> <u>large Peneroplis Foram.</u> <u>frag. of branching Anin</u>
Sample No: <u>731</u> Lat: <u>18° 05.0' N</u> Long: <u>65° 26.0' W</u> Date: <u>18 Jan '68</u> Water depth: <u>21 M</u>	<u>331-</u> <u>1</u>	<u>varied</u>	<u>yes</u>	<u>Cobble</u>	<u>Specific Gravity - 2.77</u> <u>Worn Coral Reef</u> <u>rock covered with pink, green,</u> <u>brown, algae + Bryozoa. ci</u> <u>1 Alcyonarian Present</u> <u>Insufficient Sample</u> <u>For Analysis [Ref. only]</u>

## LOG FOR GRAB SAMPLES

Project No: 325Location: Puerto RicoLogged By KNOOPDate Logged 8 Feb 68

	La No.	Color	Calc. Mat.	Sediment Type	Remarks
Sample No: <u>2314</u> Lat: <u>18° 06.0' N</u> Long: <u>65° 26.0' W</u> Date: <u>18 Jan '68</u> Water depth: <u>24 M</u>	<u>325-</u> <u>10</u>	<u>5Y 8/1</u>	<u>YES</u>	<u>Sand</u>	<u>Coral Sand</u> <u>Size &amp; Reference</u> <u>Samples only</u>

# SEDIMENT SIZE AND COMPOSITION

Cruise 854608  
 Sample 213  
 Latitude 16°08.3'N  
 Longitude 61°53.5'W  
 Corer Type MLS  
 Length 0.0  
 Penetration 0.0  
 Depth 914  
 Taken 23/02/68  
 Analyzed 03/06/68

Cruise 855198  
 Sample 725  
 Latitude 18°05.0'N  
 Longitude 65°26.0'W  
 Corer Type 0  
 Length 0.0  
 Penetration 0.0  
 Depth 21  
 Taken 18/01/68  
 Analyzed 10/04/68

ID. NO. 333 1  
 INTERVAL 0.0- 0.0

MM	PER
4.0000	0.000
2.0000	0.594
1.0000	0.563
0.5000	0.970
0.2500	1.063
0.1250	1.877
0.0625	5.787
0.0312	48.170
0.0156	23.616
0.0078	3.754
0.0039	1.564
0.0020	1.251
0.0010	0.938
0.0005	0.000
0.0005-	9.853

GRAVEL	0.594
SAND	10.260
SILT	77.104
CLAY	12.043

MEAN (MM)	0.0234
MEAN (PHI)	5.4149
STAN DEV	2.3856
SKEWNESS	0.6363
KURTOSIS	2.2298

CAC03	92.000
ORG CARBON	0.000
CCLCR	5.6/1
DCM CNSTIT	
SEC CNSTIT	

ID. NO. 331 2  
 INTERVAL 0.0- 0.0

MM	PER
4.0000	3.265
2.0000	5.523
1.0000	13.767
0.5000	33.703
0.2500	30.337
0.1250	8.285
0.0625	1.109
0.0312	4.011
0.0156	0.000
0.0078	0.000
0.0039	0.000
0.0020	0.000
0.0010	0.000
0.0005	0.000
0.0005-	0.000

GRAVEL	8.789
SAND	87.200
SILT	4.011
CLAY	0.000

MEAN (MM)	0.5678
MEAN (PHI)	0.8167
STAN DEV	1.2887
SKEWNESS	0.3613
KURTOSIS	-0.3153

CAC03	94.000
ORG CARBON	0.000
CCLCR	5Y 8/1
DCM CNSTIT	
SEC CNSTIT	

\*INSUFFICIENT SAMPLE FOR  
 PIPETTE ANALYSIS.

# SEDIMENT SIZE AND COMPOSITION

Cruise	Diver
Sample	314
Latitude	18°5.0'N
Longitude	65°6.0'W
Corer Type	0
Length	0.0
Penetration	0.0
Depth	24
Taken	08/01/68
Analyzed	08/02/68

ID. NO.	325	10
INTERVAL	0.0-	0.0
MM	PER	
4.0000	0.000	
2.0000	4.848	
1.0000	15.362	
0.5000	37.150	
0.2500	33.995	
0.1250	8.002	
0.0625	0.643	
0.0312	0.000	
0.0156	0.000	
0.0078	0.000	
0.0039	0.000	
0.0020	0.000	
0.0010	0.000	
0.0005	0.000	
0.0000-	0.000	
GRAVEL	4.848	
SAND	95.152	
SILT	0.000	
CLAY	0.000	
MEAN (MM)	0.5869	
MEAN (PHI)	0.7687	
STAN DEV	0.3966	
SKEWNESS	0.0797	
KURTOSIS	-1.2425	
CAC03	0.000	
ORG CARBON	0.000	
COLOR	5Y 8/1	
DOM MINERAL		
SEC MINERAL		

**APPENDIX B**  
**Water Transparency and Color Data**



LAT. (°N)	LONG. (°W)	TIME (local)	TIME ZONE	DATE	CLOUDS		DEPTH (Meters)		FOREL NO.
					AMT.	TYPE	SECCHI	DISC	
							White	Black	

USS AFFRAY

20°56.2'	70°50'	1400	+ 5	11 Oct 67	40%	-	17	8	4
20°31.5'	69°56'	0830	+ 4	12 Oct 67	40%	-	44	17	1
20°18'	69°50'	1155	+ 4	12 Oct 67	30%	-	13	11	3
18°47'	64°47'	1025	+ 4	14 Oct 67	50%	Cu	17	7	4
18°47.5'	64°47'	1035	+ 4	14 Oct 67	50%	Cu	17	7	4
18°36.8'	64°56'	1235	+ 4	14 Oct 67	50%	Cu	12	4	8
18°28.3'	64°54'	1415	+ 4	14 Oct 67	50%	Cu	17	9	3
18°32	65°07'	1525	+ 4	14 Oct 67	60%	Cu	21	9	3
18°14.5'	65°20'	0830	+ 4	15 Oct 67	-	-	13	8	3

USS HUMMINGBIRD

18°08'	74°27.5'	1200	+ 5	5 Jul 68	50%	Cu	11	7	3
20°10.9'	72°16'	1200	+ 5	13 Jul 68	40%	Cu	39	14	1
17°53.8'	65°36.6'	1200	+ 5	23 Jul 68	40%	Cu	12	8	3

USS LIMPIN

17°52.9'	65°52.5'	1255	+ 4	2 Jul 68	50%	Cb	21	8	3
17°29.5'	68°44.9'	1230	+ 4	3 Jul 68	100%	Cb	18	6.5	5
17°08.1'	71°49.9'	1237	+ 4	4 Jul 68	40%	Cb	22	-	5

USS ABILITY

18°05'	65°26'	1005	+ 4	18 Jan 68	50%	Cu	19	14	4
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13. ABSTRACT			
<p>Mine Divisions 41, 45, and 85 collected oceanographic data in the Caribbean Sea from August 1967 to August 1968 in support of Project FLOOD. Most of the data were collected in the vicinities of Hispaniola, Puerto Rico, and the Virgin Islands.</p> <p>Acceptable data included 78 bathythermograms (BT's), 22 bottom sediment samples, and 16 water transparency (Secchi disc) and color (Forel scale) observations.</p> <p>The data are a useful contribution to knowledge of the marine environment of the Caribbean Sea and will be available to agencies and institutions through the National Oceanographic Data Center.</p>			

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
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